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FOREST SERVICE
U.S. DEPARTMENT OF AGRICULTURE
INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION
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USDA Forest Service
Research Note INT-243
March 1978

FUEL PARTICLE DIAMETERS OF WESTERN HEMLOCK SLASH

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ABSTRACT

Quadratic mean diameters for converting fuel particle intersection counts into volume estimates for 1-, 10-, and 100-hour moisture timelag classes were determined for western hemlock (Tsuga heterophylla *(Raf.) Sarg.) slash particles in the Pacific Northwest.*

The planar intersect technique is commonly used to inventory small dead and down woody fuels (Brown 1971, 1974; Brown and Roussopoulos 1974). To facilitate fieldwork, particle intersections are tallied by three size classes that correspond to 1-, 10-, and 100-hour average moisture timelag classes (Fosberg 1970):

Fuel moisture time-lag (h)	*Diameter at intersection (cm)*
1	0.0 - 0.6
10	0.6 - 2.4
100	2.5 - 7.6

The National Fire-Danger Rating System recognizes these same fuel moisture timelag classes (Deeming and others 1977).

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In sampling small dead and down woody fuel, a fuel particle is assigned to a size class on the basis of its diameter at the point of intersection with the sampling plane. To convert fuel intersection counts into volume and load estimates, it is necessary to know the quadratic mean diameters of the fuel species present within each timelag class. Brown (1974) and Brown and Roussopoulos (1974) presented quadratic and arithmetic mean diameters of several species common to the western and midwestern United States (table 1). However, data on western hemlock (*Tsuga heterophylla* (Raf.) Sarg.) were not available. Western hemlock quadratic and arithmetic mean diameters suitable for use in estimating the species' volume are presented here.

Table 1.--*Slash fuel particle diameters of western hemlock and other common species*[1]

Timelag (h)	Species[2]	Number of observations	Quadratic mean diameter	Average diameter	Standard deviation
			- - - - - - - - - -	*cm* - - - - - - - - - -	
1	WH	1,692	0.21	0.14	0.15
	DF,GF,C,S	1,071	.28	.26	.10
	L	188	.31	.29	.10
	JP	138	.32	.29	.10
	O	358	.37	.34	.14
	LP	192	.40	.34	.10
	RP	181	.45	.43	.12
10	RP,O	455	1.25	1.15	.47
	JP	29	1.31	1.19	.56
	DF,GF,LP,L,S	1,273	1.34	1.24	.49
	PP,C	551	1.43	1.35	.46
	WH	386	1.55	1.43	.59
100	L,C,S	313	3.85	3.70	1.06
	RP	13	4.03	3.86	1.20
	DF,PP,GF	587	4.27	4.08	1.27
	JP	72	4.55	4.30	1.49
	WH	261	4.63	4.43	1.37
	LP	169	4.75	4.51	1.50

[1] Data for species other than western hemlock are taken from Brown and Roussopoulos (1974)

[2] The following species abbreviations are used:

C	Western redcedar *Thuja plicata* Donn
DF	Douglas-fir *Pseudotsuga menziesii* (Mirb.) Franco
GF	Grand fir *Abies grandis* (Dougl.) Lindl.
JP	Jack pine *Pinus banksiana* Lamb.
L	Western larch *Larix occidentalis* Nutt.
LP	Lodgepole pine *Pinus contorta* Dougl.
O	Oak *Quercus spp.*
PP	Ponderosa pine *Pinus ponderosa* Laws.
RP	Red pine *Pinus resinosa* Ait.
S	Engelmann spruce *Picea engelmannii* Parry
WH	Western hemlock *Tsuga heterophylla* (Raf.) Sarg.

Measurements of western hemlock diameters were taken in fresh and 1-year-old clearcut slash at three locations in the Pacific Northwest: the Soleduck Ranger District of the Olympic National Forest, and the North Bend and Skykomish Ranger Districts of the Mt. Baker National Forest.

A sample transect was randomly located across each of the three slash areas. The diameter of each western hemlock fuel particle intersecting the transect was measured at the point of intersection. Particle diameters were measured with a caliper graduated to 0.1 millimeter.

The sample size of each timelag class and the resulting quadratic and arithmetic mean diameters are presented in table 1. The slash fuel particle diameters of other common species, taken from Brown and Roussopoulos (1974), are also presented for comparison. Western hemlock appears to have a lower quadratic mean diameter in the 1-hour timelag size class than any of the other species measured. The 10-hour diameter of western hemlock, however, is larger than any of the other species. This reflects the fine branching habit of western hemlock, which has many small terminal twigs supported by a single branch. Similarly, the quadratic mean diameter of the 100-hour timelag class is slightly larger than those of most other species presented in table 1.

PUBLICATIONS CITED

Brown, James K.
1971. A planar intersect method for sampling fuel volume and surface area. For. Sci. 17(1):96-102.
Brown, James K.
1974. Handbook for inventorying downed woody material. USDA For Serv. Gen. Tech. Rep. INT-16, 24 p. Intermt. For. and Range Exp. Stn., Ogden, Utah.
Brown, James K., and Peter J. Roussopoulos.
1974. Eliminating biases in the planar intersect method for estimating volumes of small fuels. For Sci. 20(4):350-356.
Deeming, John E., Robert E. Burgan, and Jack D. Cohen.
1977. The National Fire-Danger Rating System--1978. USDA For. Serv. Gen. Tech. Rep. INT-39, 63 p. Intermt. For. and Range Exp. Stn., Ogden, Utah.
Fosberg, Michael A.
1970. Drying rates of heartwood below fiber saturation. For. Sci. 16:57-63.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1978-0-777-095-73

APR 6 '78